between the *Tulbaghia* species and the main sulphur compounds will be compared and presented.

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Antioxidant activity and cytotoxicity of three flavonoids from *Athrixia phylicoides* ethanol extract

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Bioassay-guided fractionation of ethanol extract from aerial parts of *Athrixia phylicoides* using silica and sephadex column chromatography led to the isolation of four known flavonoids; 5-hydroxy-6,7,8,3′,4′,5′-hexamethoxyflavon-3-ol (**1**), 3-0-demethyldigicitrin (**2**), 5,6,7,8,3′,4′-hexamethoxyflavone (**3**) and Quecertin (**4**). Due to low yield**,** no further tests were done on compound **3**. Isolated compounds together with crude extract were tested for antioxidant activity using DPPH-scavenging method. The crude extract showed a concentration-dependent radical scavenging activity with EC_{50} value of 10.64±0.08 μg/ml. Compound **4** was the most potent radical scavenger, exhibiting EC_{50} value of 1.27±0.25 μg/ml, followed by compounds **1** and **2** showing 2.74±0.10 and 3.41±0.09 μg ml^{-1} respectively. Cytotoxicity of ethanol extract and isolated compounds was determined against Vero cell lines using XTT colorimetric assay. The crude extract showed no or little toxicity on Vero cells at lower concentrations tested exhibiting the IC_{50} value of 107.8±0.13 μg/ml. Compound **4** showed minimal toxicity effect by exhibiting IC_{50} value of 81.38±0.33 μg/ml as compared to compound **2** (IC_{50}, 28.92±0.12 μg/ml) and compound **1** (IC_{50}, 27.91±0.18 μg/ml). The results obtained from this study provide a clear rationale for the medicinal uses of *A. phylicoides*.

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Arabidopsis thaliana knockout mutants lacking fructose 2,6-bisphosphate have decreased growth rates under fluctuating environmental conditions

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The aim of this work was to examine the physiological role of fructose 2,6-bisphosphate (Fru 2,6-P) during photosynthesis, growth and reproduction in *Arabidopsis thaliana* (L.). Three separate homozygous T-DNA knockout lines of 6-phospho-fructo-2-kinase (6-PF-2-K; EC 2.7.1.105)/fructose 2,6-bisphosphatase (F26BPase; EC 3.1.3.46) (F2KP), the bifunctional enzyme responsible for both the synthesis and degradation of Fru 2,6-P, were isolated. In all three F2KP-KO lines Fru 2,6-P metabolism was shown to be absent. Distribution of a ^{14}C label confirmed a significant increase in carbon partitioning to sucrose and a decrease in starch synthesis in F2KP-KO plants. Similarly, during the light period F2KP-KO lines exhibited an increase in sugar accumulation and decreased starch levels at both high light (300 μmol m^{-2} s^{-1}) and low light (80 μmol m^{-2} s^{-1}). When grown under high or low light conditions no growth phenotype was observed. However, F2KP-KO plants exhibited significantly reduced growth rates (*ca.* 20%) when grown under fluctuating light (80–300 μmol m^{-2} s^{-1}) or temperature (22–10 °C) during an 8 h light period or under ambient light in a glasshouse environment. Gas exchange and fluorescence analyses indicated that photosynthetic induction is delayed in F2KP-KO plants, leading to a decrease in growth and fecundity when grown in a variable environment. This work confirms the role of Fru 2,6-P in partitioning of carbon between starch and sucrose in leaves during the photoassimilation period but furthermore demonstrates a competitive growth advantage for fine metabolic regulation by Fru 2,6-P under fluctuating environmental conditions.

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Sulphur dioxide fumigation leads to increases in antioxidant enzymes and changes in the photosynthetic capability of canola plants (*Brassica napus* L.)

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Environmental stressors create challenges in the efforts of agricultural sectors to achieve sustainability in food production. Ozone (O_3), sulphur dioxide (SO_2) and nitrogen oxides (NO_x) are among the most important air pollutant gases in the atmosphere. There has been a considerable increase in the concentration of air pollutants such as SO_2 in the lower atmosphere. This phenomenon can be attributed to increases in anthropogenic activities in industrialised areas of the world. Plants respond to stress conditions by increasing the levels of reactive oxygen species (ROS). In this study the effects of different SO_2 levels on the antioxidant metabolism and the photosynthetic capability of canola plants (*Brassica napus* L.) were determined. Canola plants were grown over a time period of five months in an Open Top Chamber (OTC) system. The canola plants were fumigated with 0, 50, 100 and 200 ppb of SO_2 for 8 h per day. Chlorophyll *a* fluorescence and photosynthetic gas exchange were routinely measured. Leaf samples were taken on four different occasions to quantify the changes in the activity of the stress enzymes ascorbate peroxidase (APX), guaiacol peroxidase (POD) and superoxide dismutase (SOD). Increases in the activity of APX, POD and SOD were observed in canola plants in accordance with an elevation in the fumigation level of SO_2. The chlorophyll *a*